2002 SPARROW Total N/P (Catchments)

The Nitrogen and Phosphorus Pollution Data Access Tool (NPDAT) provides data for use in both spreadsheets and geospatial tools, such as Geographic Information Systems (GIS). For this reason, the attribute and geospatial data are served as separate downloadable files. The *attribute data* for the 2002 SPARROW nitrogen and phosphorus modeling results are accessible from the SPARROW Decision Support System at http://cida.usgs.gov/sparrow/ along with metadata. This metadata document describes the *geospatial data* (catchment boundaries) used for the 2002 SPARROW modeling nitrogen and phosphorus data layers viewable through the NPDAT.

Metadata:
- Identification_Information
- Data_Quality_Information
- Entity_and_Attribute_Information
- Distribution_Information
- Metadata_Reference_Information

Identification_Information:

 Citation:

  Citation_Information:

   Originator: U.S. Environmental Protection Agency

   Publication_Date: 20111130

   Title: 2002 SPARROW Total N/P Catchment Boundaries

   Geospatial_Data_Presentation_Form: vector digital data

   Publication_Information:

    Publication_Place: Washington, DC
    Publisher: U.S. Environmental Protection Agency

   Online_Linkage: http://gispub2.epa.gov/NPDAT
   Online_Linkage: http://water.usgs.gov/nawqa/sparrow

 Description:

  Abstract:

SPARROW (SPAtially Referenced Regressions On Watershed attributes) is a watershed modeling tool with output that allows the user to interpret water quality monitoring data at the regional and sub-regional scale. The model relates in-stream water-quality measurements to spatially referenced characteristics of watersheds, including pollutant sources and environmental factors that affect rates of pollutant delivery to streams from the land and aquatic, in-stream processing . The core of the model consists of a nonlinear regression equation describing the non-conservative transport of contaminants from point and non-point (or "diffuse") sources on land to rivers and through the stream and river network. SPARROW estimates contaminant concentrations, loads (or "mass," which is the product of concentration and streamflow), and yields in streams (mass of nitrogen and of phosphorus entering a stream per acre of land). It empirically estimates the origin and fate of contaminants in streams and receiving bodies, and quantifies uncertainties in model predictions. The model predictions are illustrated through detailed maps that provide information about contaminant loadings and source contributions at multiple scales for specific stream reaches, basins, or other geographic areas.

Purpose:

Management efforts to reduce the hypoxic zone in the Gulf of Mexico and improve the water quality of both flowing and non-flowing waters could benefit from targeting nutrient reductions toward watersheds with the highest nutrient yields delivered to downstream waters such as the Gulf of Mexico, or to local receiving waters. The model output presented as data layers was generated by the U.S. Geological Survey (USGS) and illustrates watershed nitrogen and phosphorus yields. SPARROW models provide an opportunity to prioritize watersheds based on loadings, which can then be used for taking action to increase stream monitoring and developing nitrogen and phosphorus pollution reduction strategies. This model output includes confidence intervals of model predictions, nitrogen and phosphorus yields generated within watersheds, and nitrogen and phosphorus yields delivered downstream.

Explanation of "Incremental yield" versus "Delivered incremental yield":

"Incremental yield" refers to that part of the load per unit area generated within a catchment (measured at the pore point of the watershed). Within the context of this document, catchment refers to the local drainage area for an individual stream segment.

"Delivered incremental yield" is that part of the yield generated within a catchment and delivered to a specified location after factoring in the loss of nitrogen and phosphorus in transport to that location.

Explanation of "load" versus "yield":

The load of a river-borne constituent such as nitrate is the amount (or mass) that passes a given point on the river over a given period. The yield of a river-borne constituent is the load per unit drainage area, in this case, a catchment.

Nitrogen and phosphorus loads and yields are calculated as follows:

Loads = streamflow (discharge) x nitrogen or phosphorus concentration in streamwater

Yields = nitrogen or phosphorus load ÷ watershed area

Specific layers include:
- Total Nitrogen incremental yield by catchment
- Total Phosphorus incremental yield by catchment

Supplemental_Information:

The 2002 SPARROW nitrogen and phosphorus models for Major River Basins (MRB) 1, 2, 3, 4, 5, and 7 employed two different stream networks and associated catchments. The MRB 1 model used the stream network (1:100,000-scale) and catchments from the National Hydrography Dataset Plus (NHDPlus) and the models for MRBs 2, 3, 4, 5 and 7 used the Enhanced River Reach File Version 1 (MRB_E2RF1WS) stream network (1:500,000-scale) and catchments. MRB1 covers the Northeast. MRB2 covers the South Atlantic-Gulf and Tennessee River basins. MRB3, covers the Great Lakes, Ohio, Upper Mississippi, and Souris-Red-Rainy River basins. MRB4, covers the Missouri River basins. MRB5, covers the Lower Mississippi, Arkansas-White-Red, and Texas-Gulf River basins. MRB7, covers the Pacific Northwest River basins.

The synthesis of these SPARROW models across MRBs is described by: Preston, Stephen D., Richard B. Alexander, Gregory E. Schwarz, and Charles G. Crawford, 2011. Factors Affecting Stream Nutrient Loads: A Synthesis of Regional SPARROW Model Results for the Continental United States. Journal of the

Data_Limitations:

All models, including SPARROW, have uncertainty associated with them. There are many reasons for that uncertainty including: 1) limitations in the supporting stream monitoring and geospatial data; 2) limitations in the understanding of the environmental processes affecting water quality; and 3) limitations of the modeling approach in representing the environmental processes accurately. It is difficult to precisely quantify the amount of uncertainty related to the latter two items.

One important cause of uncertainty is the limitation in the number of monitoring sites available for model calibration. As in any statistical model, uncertainty in SPARROW models decreases as the number of sites available for calibration increases. In the case of SPARROW, the number of calibration sites is defined by the number of sites with sufficient water quality and discharge data for calculating a constituent load. Historically, the number of sites represented in federal, state and local agency monitoring programs has vacillated. However, recently the number of sites with sufficient monitoring data has begun to decline. Such declines should be expected to cause greater uncertainty in all environmental models, including SPARROW.

Uncertainty is always present in environmental models such as SPARROW. Uncertainty can be caused by many factors, but it is often related to limitations in the quantity and quality of the supporting data sets. These limitations are unavoidable because of the magnitude of the effort and the lack of resources available to support more extensive data base development. Thus, there are intrinsic measurement uncertainties in describing stream water quality loads from the monitoring data that are used to calibrate the SPARROW model.

Like all statistical models, SPARROW models are developed through a calibration process in which parameter values are estimated to minimize uncertainty in predicting stream constituent loads. Uncertainty is quantified as the residual error in load prediction that cannot be accounted for through parameter adjustment. The overall uncertainty in the model is quantified through a number of statistical diagnostics.

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     Time_Period_Information:

          Single_Date/Time:

               Calendar_Date: 20111130

     Currentness_Reference: Publication Date

Status:

     Progress: Complete
     Maintenance_and_Update_Frequency: As Needed

Spatial_Domain:

     Bounding_Coordinates:

          West_Bounding_Coordinate: -125.001228
          East_Bounding_Coordinate: -65.999382
          North_Bounding_Coordinate: 49.383865
          South_Bounding_Coordinate: 24.500420

Keywords:

     Theme:

          Theme_Keyword_Thesaurus: ISO 19115 Topic Category
          Theme_Keyword: environment
          Theme_Keyword: water quality
          Theme_Keyword: monitoring
          Theme_Keyword: geoscientificInformation
          Theme_Keyword: location

     Theme:

          Theme_Keyword_Thesaurus: EPA GIS Keyword Thesaurus
          Theme_Keyword: Environment
          Theme_Keyword: Water

     Theme:

Theme_Keyword_Thesaurus: none
Theme_Keyword: SPARROW
Theme_Keyword: US Geological Survey
Theme_Keyword: nutrient
Theme_Keyword: pollution
Theme_Keyword: nitrogen
Theme_Keyword: phosphorus
Theme_Keyword: catchment
Theme_Keyword: incremental yield

Place:

Place_Keyword_Thesaurus: None
Place_Keyword: Conterminous United States
Place_Keyword: Major River Basin
Place_Keyword: MRB2
Place_Keyword: MRB3
Place_Keyword: MRB4
Place_Keyword: MRB5
Place_Keyword: MRB7

Access_Constraints: None.

Use_Constraints: None. Please check sources, scale, accuracy, currentness and other available information. Please confirm that you are using the most recent copy of both data and metadata. Acknowledgement of the USEPA and USGS would be appreciated.

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Security_Information:

Security_Classification_System: FIPS Pub 199
Security_Classification: No Confidentiality
Security_Handling_Description: Standard Technical Controls

Data_Quality_Information:

Lineage:

Source_Information:
Source_Citation:
Citation_Information:
Originator:
U.S. Geological Survey (USGS) and the U.S. Environmental Protection Agency (USEPA)
Publication_Date: none
Title: National Hydrography Dataset Plus (NHDPlus) Catchments
Edition: Version 1
Geospatial_Data_Presentation_Form: vector digital data
Online_Linkage: <http://www.epa.gov/waters>
Source_Scale_Denominator: 1:100,000 network, 30M elevation, 1:24,000 HUC12s
Source_Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 2006
Source_Citation_Abbreviation: NHDPlus Catchments

Source_Information:
Source_Citation:
Citation_Information:
Originator:
U.S. Geological Survey (USGS) and the U.S. Environmental Protection Agency (USEPA)
Publication_Date: none

Title: Enhance River Reach File Version 1 Catchments (MRB_E2RF1WS)
Edition:
Geospatial_Data_Presentation_Form: vector digital data
Online_Linkage: <
http://water.usgs.gov/GIS/metadata/usgswrd/XML/mrb_e2rf1ws.xml>
Source_Scale_Denominator: 1:500,000 network, 100M elevation
Source_Time_Period_of_Content:
Time_Period_Information:
Single_Date/Time:
Calendar_Date: 2007
Source_Citation_Abbreviation: MRB_E2RF1WS Catchments

Process_Step:

Process_Description:

For MRBs 2, 3, 4, 5, and 7, converted the GRID version of the
MRB_E2RF1WS-based catchments to a shapefile using ESRI ArcGIS.

Process_Step:

Process_Description:

For MRB1 (northeast), NHDPlus version 1.0 catchments from
hydroregions 1 and 2 were used.

Entity_and_Attribute_Information:

Detailed_Description:

Entity_Type:

Entity_Type_Label:
Entity_Type_Definition:

Entity_Type_Definition_Source:

NHDPlus Attribute:

Attribute_Label: ERF1_ID

Attribute_Definition: Relate key for associating catchment boundaries with catchment attributes

MRB_E2RF1WS *Attribute:*

Attribute_Label: Com_ID
Attribute_Definition: Relate key for associating catchment boundaries with catchment attributes

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Distribution_Information:

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Resource_Description: Downloadable Data
Distribution_Liability:
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 Metadata_Standard_Name: FGDC Content Standards for Digital Geospatial Metadata
 Metadata_Standard_Version: FGDC-STD-001-1998
 Metadata_Time_Convention: local time
 Metadata_Security_Information:

  Metadata_Security_Classification_System: None
  Metadata_Security_Classification: Unclassified
  Metadata_Security_Handling_Description: None